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Isolation and AntibioGram Study of Infectious Bovine Kerato-conjunctivitis

G Deepika Kumari¹, M Navya², P Tejaswi³, Mohd. Umar⁴

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Abstract

A buffalo of 4 lactations was presented to the Teaching Veterinary Clinical Complex, NTRC VSc., Gannavaram with a case history of lacrimation, pinkness of both the eyes and mild conjunctivitis. The lacrimal samples were collected aseptically and sent for further laboratory diagnosis for confirming the causative agent. The colonies were mucoid with sticky in nature, on Grams staining characteristic diplococci were observed, produced β -hemolysis on blood agar and biochemically oxidase and catalase positive provisionally suggestive of *Moraxella bovis*. The bacterium was susceptible to tetracyclines.

Keywords: *Moraxella bovis*; Diplococci; Conjunctivitis.

Introduction

Moraxella bovis, a Gram negative aerobic diplococci bacterium responsible for causing an eye disease in bovines called Infectious bovine kerato-conjunctivitis (IBK) characterised by conjunctivitis, odema of the eye, ulceration and corneal opacity.⁵ It causes high morbidity and low mortality with marked reduction in production. The infection is seen only in bovines and synonymously called as pink eye or New forest disease.² The disease is highly contagious and is transmitted by direct contact or by flies from the infected ones. The cattle exhibits signs of pain in the eye with increased lacrimation, excessive blinking and pinkness of eye. Predisposing factors impose a major role in the disease occurrence. Disease is complicated with concurrent infections of virus like Infectious bovine rhinotracheitis (IBR), bacterial infections related with mycoplasma and listeria and rarely with

thalezia nematodal infections.⁶ The disease is more susceptible in summer than in autumn.¹

Materials and Methods

A buffalo was presented to the Teaching Veterinary Clinical Complex, NTR CVSc., Gannavaram with a case history of severe lacrimation, mild conjunctivitis associated with pinkness of both the eyes. The lacrimal secretions were aseptically collected in a sterile swab container having nutrient broth and incubated in an incubator for a period of 24 hrs and 37°C was maintained.

Isolation of *Moraxella bovis* on basal and differential agars

After attaining sufficient growth in the pre enrichment medium, i.e. nutrient broth, it was streaked on brain heart infusion agar. For further

confirmation it was isolated on blood agar for detecting the haemolytic activity.

Direct Microscopic examination

Grams staining was performed to examine the smears prepared from basal and differential agars.

Biochemical characterisation

The colonies from the blood agar were further subjected for biochemical tests like oxidase and catalase test.

Catalase test: Catalase enzyme catalyzes the decomposition of hydrogen peroxide to water and oxygen. It is a very important enzyme in protecting the cell from oxidative damage by reactive oxygen species.

Oxidase test: The oxidase test was used to identify bacteria that produce cytochrome c oxidase, an enzyme of the bacterial electron transport chain. When present, the *cytochrome - C oxidase* oxidizes the reagent (*tetramethyl-p-phenylenediamine*) to (*indophenols*) purple color end product. When the enzyme is not present, the reagent remains reduced and is colorless.

Antibiotic resistance pattern

The antibiotic disc diffusion method was done to test the sensitivity of *Moraxella bovis* isolates as per the Kirby and Buear method. The Mueller-Hinton agar plates were incubated for 24 hrs at 37°C and the zone of inhibition of bacterial growth by the antibiotic discs was noted in comparison with the standard charts.

Results and Discussion

Based on the clinical symptoms it was suggestive that the ocular disease may either be a bacterial or viral infection. Morphological characterisation was carried to rule out the viral infections which might be of Infectious bovine rhinotracheitis virus (IBR). The ocular swabs enriched in nutrient broth were streaked on basal and differential media.

Growth on basal and differential agars

On the basal agar, i.e. Brain heart infusion agar white mucoid, sticky colonies were grown after a period of 24 hrs. When further streaked on blood agar beta hemolysis was noted (Fig 1). *Moraxella bovis* produces partial hemolysis on the blood agar confirming the presence of the bacteria.



Fig. 1: On blood agar beta hemolysis, i.e. partial hemolysis is observed

Direct Microscopic examination

Grams staining was performed from the smears prepared from basal and differential agars. Typical characteristic Gram negative pink coloured diplococci were noticed (Fig. 2). Majority of the bacteria appeared in cocci and in groups and few characteristic diplococci significant of *Moraxella bovis* was also identified.

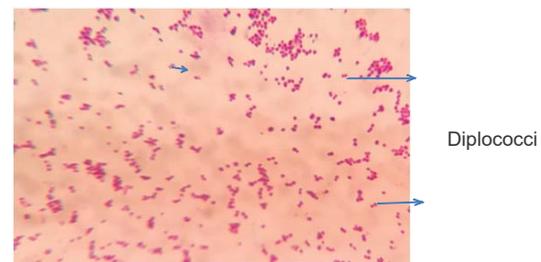


Fig 2: Characteristic appearance of gram negative diplococci on grams staining

Biochemical tests

Biochemical characterisation revealed catalase positive, production of catalase enzyme by the bacterium with production of bubbles in the form of oxygen (Fig. 3). Oxidase test was also positive indicated by the presence of production of indophenols detected in the form of purple colour (Fig. 4). Both the tests were confirmative for *Moraxella bovis* bacteria.

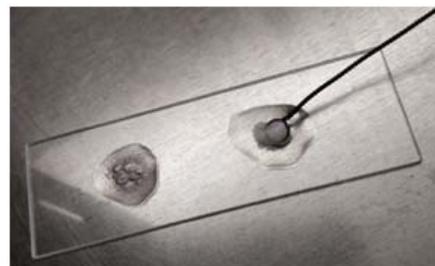


Fig. 3: Catalase test–production of oxygen

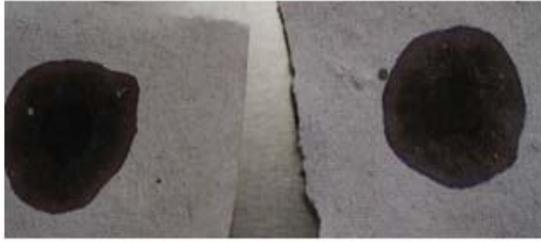


Fig. 4: Oxidase test–production of indophenols

Antibiotic susceptibility

On performing ABST the culture was susceptible primarily to tetracyclines, pencillins and enrofloxins and totally resistant to gentamicin. Similar results were reported by Parin et al., and revealed that oxytetracyclines were susceptible to *Moraxella bovis* bacteria.

Conclusion

Moraxella bovis is one of the microorganism responsible for the ocular infections in cattle. In the above case study an attempt was made to isolate and confirm the Gram negative bacteria *Moraxella bovis*. Colonial morphology and biochemical tests

provisionally confirm the infection as *Moraxella bovis*. The bacteria was susceptible to tetracyclines when compared to other antibiotics.

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Conservation Agriculture: The dynamics of Ecology and Ecological Services

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Abstract

The green revolution in India has basically been the resultant of seed-fertilizer-water application with massive participation of farmers, scientists and executor at different level to usher a quantum jump of food grain production, from 55 MT(1955) to 120 MT(1970). But the dividend of green revolution has been outnumbered by fall out in ecological balances due to injudicious use of agrochemicals associated with farm mechanization led soil erosion and compaction. The skewed focus on selected high yielding gene in rice and wheat has been responsible for loss of crop biodiversity. In our operating agro-ecosystem, the provider of food-fuel-fodder, water is contaminated, soil is eroded, organic carbon is depleted and biodiversity is marginalized. So, we need to have Conservation Agriculture through minimizing soil disturbances, retention of crop residues and sustainable intensification in classical crop rotation. All these being done with a goal to protect and preserve our precious natural resources, stabilizing and augmenting food production and livelihood for millions, and, of course making our agro-ecosystem more resilient to generate dedicated ecological services to mankind and other life forms to save our civilization. The text of conservation agriculture is more contextual when the brunt of climate change is becoming more deleterious and complex. The issues of farmers' participation stand so critical simply because without their participation, no conservation agriculture is possible.

Keywords: Conservation agriculture; Climate change; Ecological services, Ecological resilience, Retention of crop residue.

Introduction

Poverty, pollution and erosion are the three deleterious issues to civilisations and agriculture, perhaps, the worst affected, sector of ecological and economic concerns. Every year, around 15-18 tonnes of top soils are eroded off to add to the impoverishment of soil regime. On the other side, the energy prodigal nature of agriculture along with over exploitation of ground water have added to the misery of our key production ecology.

Conservation agriculture is mainly a concept for resource-saving agricultural crop production to achieve acceptable profits along with high and sustainable production levels subsequently conserving the environment" (FAO 2007). So, it has evolved as an alternative approach to conventional agricultural systems in which tillage is practised to varying levels to control weeds, pests, nutrient incorporation and to check soil compaction problems where conservation agriculture helps to maintain, to the extent possible, a year-round soil

cover by residue retention from previous crops or incorporation from another field/crop and/or a cover crop to improve the soil quality and minimal soil disturbance by no or reduced tillage practices and through crop diversification and/or crop rotations to restrict the pest problems (Dillaha et al.).

Globally, as an estimate, 1.53 billion hectares of cropland (Thenkabail et al., 2009) in 2009, are covered under conventional tillage. Global cropland under conservation agriculture in 2009 was approximately 106 million hectares (Derpsch et al., 2009) where in conservation tillage seeds are planted into untilled soil by opening either a narrow slot, trench or band only of sufficient width and depth to obtain proper seed coverage.

Conservation agriculture is being adopted rapidly in both developed and developing countries, mainly larger land holders are eager to adopt with the exception of Brazil, where conservation agriculture has been adapted by many small farmers. In general, perceived benefits of conservation agriculture includes more profitable and sustainable agricultural production, reduced fuel and machinery costs, reduced pesticide costs, improved opportunities for double and triple cropping, higher yields, improved soil quality, restored soil biodiversity, reduced erosion and depletion, improved soil water management, soil carbon sequestration (improved soil quality and carbon sequestration for benefit in terms of climate change), and water quality management due to possible reductions in leaching losses of agrochemicals, sediment, and organic matter from cropland.

And also there are many potential ecosystem services associated with the practice of conservation agriculture. Ecosystem services are mainly, benefits to humans from the ecosystems. Ecosystem services were classified into the following categories of services by the Millennium Ecosystem Assessment (2005). Ecosystem services to which conservation agriculture may have significant contributions are,

Provisioning services: These are ecosystem products or functions that support different life systems in and around.

- food (including seafood and game), crops, wild foods, and spices
- water
- pharmaceuticals, biochemicals, and industrial products
- energy (hydropower, biomass fuels)

Regulating services: These are ecosystem functions that make the system deterrent of impurities, pollutants and regulate inhibitors to ecosystem resilience.

- carbon sequestration and climate regulation
- soil moisture storage
- regulation of stream flows and groundwater levels
- waste decomposition and detoxification
- purification of water and air
- crop pollination
- pest and disease control
- erosion control

Support services: The services that make the ecology more conducive to system productivity and resilience.

- nutrient dispersal and cycling
- seed dispersal
- primary production

Cultural services: This is related to functioning that supports aesthetics, entertainment, values and cultural ethos of community people and stakeholders.

- cultural, intellectual and spiritual inspiration
- recreational experiences (including ecotourism)
- scientific discovery

The erosion of ecology in natural resources

At present, food and agricultural systems have greater success in supplying large volumes of food to global markets. However, high-external input, resource-intensive agricultural systems have caused massive deforestation, water scarcities, biodiversity loss, soil depletion and high levels of greenhouse gas emissions. Despite significant progress in recent times, hunger and extreme poverty persist as critical global challenges. Even where poverty has been reduced, pervasive inequalities remain, hindering poverty eradication.

Restoration of ecology and ecological services through Conservation Agriculture

The core principles of agro-ecology (Archer S. 2008), and have the immediate objectives of:

1. building soil structure, improving soil

health, recycling nutrients and ensuring local sourcing,

2. conserving and using water efficiently,
3. sustaining and improving functional diversity (both on a spatial and a temporal scale).

Hence, conservation agriculture could help in the restoration and re-engineering of ecology including the agro-ecology to a great extent. Conservation agriculture may help in re-building agro-ecology by maintaining carbon sequestration, maintenance of soil health, by checking soil erosion and ground water depletion, energy balance, mitigating climate change related problems etc through maintaining ecosystem services.

Carbon Sequestration and Climate Regulation

One of the most positive aspects of conservation agriculture is its contribution to increase soil carbon compared with tillage-based conventional agriculture systems. Lal (2004) in his studies of the benefits of increasing soil carbon on its potential for carbon sequestration for climate regulation found that the carbon sink capacity of the world's agricultural and degraded soils is 50 percent to 66 percent of the global historic carbon loss of 42 to 78 gigatons of carbon and that improved land management practices on the world's agricultural and degraded soils could sequester 50 percent to 66 percent of the historic soil carbon loss. This is equivalent to 0.4 to 1.2 Gt C/year, or 5 percent to 15 percent of global carbon emissions. Lal also stated that the rate of increase in the Soil Organic Carbon (SOC) stock, through recommended management practices, follows a sigmoid curve, attains the maximum 5 to 20 years after adoption of recommended management practices, and continues until SOC attains a final equilibrium. Hillel and Rosenzweig (2009) also studied that the conversion to no-till farming increased soil organic carbon by rates varying from 0.1 to 0.7 Mg/ha-yr and, like Lal, indicated that such positive increments cannot be expected to continue indefinitely as well managed carbon depleted soils will tend to approach their natural equilibrium (or C saturation) state within a few decades. Lal (2004) reported similar rates of soil organic carbon sequestration in agricultural and restored ecosystems depending on soil texture, profile characteristics, and climate, which ranged from 0 to 0.15 Mg/ha-year in dry and warm regions, and 0.1 to 1.0 Mg/ha-yr in humid and cool climates.

Soil Moisture Storage

In semi-arid and arid regions, variable pattern of rainfall and scarcity are significant constraints to agricultural productivity and here, conservation agriculture would be expected to increase infiltration, soil moisture storage and utilization, and also water use efficiency. Unfortunately, in many low rainfall regions with significant dry seasons, it is difficult to maintain an effective soil organic matter cover because of competing uses as livestock feed or sometimes as fuel. In these cases, conservation agriculture may not work because of removal of the organic cover, even with no-till, results in bare soil and the formation of a soil crust, which will decrease the potency for water infiltration. This was stated by Rockström et al. (2009) in case of conservation farming strategies for arid and semi-arid agriculture in East and Southern Africa. It was seen that yields were higher with conservation agriculture than conventional tillage during drier rainy seasons but there was not much difference in yields during wetter rainy seasons suggesting that conservation farming in savannah agro-ecosystems may foremost function as a water harvesting system, which will enhance the ability of crops to check dry spells.

Water Productivity

The key principles for improving agricultural water productivity are to infiltrate as much precipitation or irrigation as possible while simultaneously reducing all soil water outflows, i.e. drainage, seepage, percolation, and soil evaporation loss. And conservation agriculture helps by enhancing infiltration, reducing soil evaporation, and increasing soil water holding capacity. It has been seen for conservation agriculture in arid and semi-arid East and Southern Africa, crop yields improved 20 percent to 120 percent, and water productivity increased by 10 percent to 40 percent (Rockström et al., 2007).

Soil Erosion

Conservation agriculture and other forms of conservation tillage highly reduce soil erosion which has been documented in most of the studies regarding conservation agriculture. A study conducted in Mississippi (Dabney et al., 2004), it has found that, on a silt loam soil comparing no-till and chisel/disc till under corn cultivation, no-till

decreased soil erosion significantly while the land was in no-till for 5 to 10 years and for the first year after no-till ended, but a year no-till was abandoned and tillage was reinstated, the protective effects of the previous no-till were no longer significant.

Energy balance

Complex mechanical and technological operations in agriculture have a significant influence on energy consumption and environmental pollution. Plant production system involves much energy in soil tillage, sowing, spraying, fertilization, watering, harvesting, transportation, and storing. Especially energy consuming are soil tillage operations such as ploughing, deep soil loosening, and also the application of rotary tillage equipment (Koga et al., 2009 and Stajniko et al., 2009). In many cases, conventional tillage, i.e. ploughing, consumes 29-59% of total diesel required as fuel for the complete technology (Koga et al., 2009, Stajniko et al., 2009 and Barut et al., 2011). Fuel consumption for soil tillage field operations depends greatly on different technical, technological, meteorological and other conditions (Sirhan et al., 2002 and Mileusni et al., 2010). Mileusnic et al., (2010) found that fuel consumption in conventional tillage and no-tillage systems is highly influenced by tractor engine power, the working width of soil tillage equipment, the number of working parts, the distance separating the parts, the equipment weight and other parameters also. To reduce cost of soil tillage and increase in the environmental friendliness, reduced tillage or no-tillage systems are highly needed. The main goals of these tillage systems are the sustainable environment and soil, for protection of the soil from erosion, for decrease in leaching of the fertile soil layer, or to reduce work time and fuel consumption, and decrease the cost of agricultural production (Sarauskis et al., 2014, Lithourgidis et al., 2009 and Morris et al., 2010). And the energy balance assessment of different technologies states that reduced soil tillage technologies are often more advantageous than the traditional ones in terms of savings in diesel, i.e. fuel consumption (Mileusni et al., 2010) and work time (Sanchez-Giron et al., 2007) as well as in terms of environmental sustainability and the reduction of the gaseous emissions causing the greenhouse effect (Stajniko et al., 2009, Sarauskis et al. 2014 and Morris et al., 2010). The well-balanced management of energy input intensity is one of the most important tasks for modern agriculture, as energy is an important factor for the socio-

economic development of any country, ensuring energy safety, economic competitiveness and environmental protection (Ang et al., 2010 and Eskandari et al., 2015).

Bio-diversity conservation

The intensification of agriculture and the traditional techniques based on extensive tillage have negative impact on soils, causing degradation in the physical and chemical parameters and causing loss of biodiversity. Conservation agriculture and the related management practices have demonstrated in the last decades to be an efficient tool to combine food productivity with environmental protection around the world. So, the reduction or no-tillage, the permanent soil cover, and the crop rotation or diversification practices have discernible positive effects on soils, including the improvement of physical and chemical properties, the decrease of water run-off and wind erosion, and an increase of water retention. The use of cover crop and the organic residues on the surface enhance the stability of soils and regulate temperatures. Therefore, the biodiversity increases (Conti 2015).

Conclusion

To ensure food security, maintaining factor productivity at a sustainable level and an egalitarian growth, the resilience of ecology is a must. Conservation Agriculture (CA) is organically dovetailed to the resilience of ecology and ecological services there in. So, minimal disturbances to soil, incorporation of crop residues to soil and reengineering the cropping sequence with a view to more eco friendly response to production interventions as much as earning livelihood for millions are the basic approaches being followed in Conservation Agriculture. If ecological services are arrested of natural functioning and behaviour, no agricultural production and management is possible. With erosion of soil at its present rate, contamination of both ground and surface water and destruction of biodiversity at its steep decadence, our agriculture is confronting with serious threats, which is being reflected in stagnant growth and deteriorating quality in all terms and connotations.

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Krishi Vigyan Kendra (KVK) and its Role in the Upliftment of the Farm Women in Indian Agriculture

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Abstract

Indian agriculture started having both institutional reform and structural adjustment since 1960. In 1952 and with the inception of Community Development Programme (CDP), we introduced what we call, a comprehensive approach by grossly conglomerating the different rural institutions for a loosely defined rural development activities. The resources allotted were extremely scant and the number of functions attempted was extremely high; nevertheless community development programme, unleashed a huge pool of activities and humongous impact as well. So, global statistics indicate that women are less likely to be involved in planning, research development or application of science than men. Statistics further indicate that women are unequally represented in science and their career progression is not comparable to their male colleagues. Why is it that the numbers of women in scientific institutions remain below those of men? Where the participation and contribution of women in Indian agriculture are not only integral but also comprehensive. Farm women are participating to tune of 70-80% in all agriculture operations. Their participations are very much distinct in raising of seedlings, intercultural operation, weeding, harvesting and post harvest value addition activities. So in this changing scenario of Indian agriculture, there is a strong need for institutional innovations to foster the faster reach of innovations to the farmers and farm women as well.

Keywords: Agriculture; Farm women; Gender; Institution; Training.

Introduction:

The global as well as Indian agriculture is now facing the problem of declining growth, increasing stress, and increasing ecological entropy. These one would go more serious in the face of global warming and climate change. The unabated population growth has made land man ratio a squeezing one across the world. The overall growth in world agriculture in now set to a dismal plight, just below 0.5 percent. Gone are the days, when one can think in mundane and classical way to transform the farmer only through providing some critical inputs and exotic knowledge. Now, we have to think for a total transformation taking "Change of knowledge" as the most critical inputs. All cognitive changes

then must undergo a motivational transformation and all motivational transformation should be translated into the operational skills for being properly applied and dully appreciated. This whole lot of transformation needs the application of basic principles of social chemistry and social dynamics. Indian agriculture started having both institutional reform and structural adjustment since 1960. In 1952 and with the inception of Community Development Programme (CDP), we introduced what we call, a comprehensive approach by grossly conglomerating the different rural institutions for a loosely defined rural development activities. The resources allotted were extremely scant and the number of functions attempted was extremely high; nevertheless community development

programme, unleashed a huge pool of activities and humongous impact as well. The institutional bases of market led extension are not that strong and capable of supporting peoples' demand and services to be delivered. Agriculture is one of so many responsibilities and has failed to receive due and adequate attention. The food crises kept on surging up and the Government came to an understanding that agriculture must be the special focus area of the nation and is to keep insulated of the brunt of hunger and impoverishment. In 1960 India started Intensive Agriculture district Programme (IADP) and in 1964, we introduced intensive agriculture area programme (IAAP) through both intensification and integration of agriculture research and rural development efforts that took a new height in 1965-66 through the introduction of an ambitious programme, called HYVP. This was basically a functional symphony between physical input and human skills. The HYVP approach started paying out in the early part of seventies and triggered a quantum jump from a poultry 55 million tonnes of food production to 110 million tons of food production. This was branded as green revolution of India. The vertical growth in agriculture had been counter balanced against a skewed distribution of the benefits. So, India started welfare oriented programme, like Small and Marginal Farmer Development Programme (SMFDP). Integrated Tribal Development Programme and a series of child and women welfare programme. Some strategic programme like lab to land and operational research project kept on complementing. The first KVK in India came into being in 1974 at Pondicherry. The basic purpose was to impart need based training for capacity building of the farmers and the farmwomen around the KVK villages. This was to be done through imparting vocational training and on farm demonstration. Training is the capacity building process and demonstration is the methodology to display of the efficacy of the know-how and do-how of the critical inputs. All these were being done at a time when Training and Visit System had been in its operation. So, it had been a clandestine synergy between World Bank approach, i.e. T and V system and lab to land experiments. Right now, more than five hundred KVK in India are to create a huge network of technology dissemination and feedback mechanism. The socialization of KVK depends on the extension inputs it successfully imbibes, assimilates and internalizes in an isochronous manner. An evolving KVK system in India has curves and dents, elements and elevation, direction and dictum to make a unique institution for socialization of

agricultural technology. At the beginning it was basically banking on available technology limited demonstration and few selected farming, along and across the objectives set by the KVKs. The on farm demonstration popularly known as OFD, gradually started losing its desired applicability and expected impacts. The reasons can be catalogued into:

- (a) Technological e.g. non-availability of appropriate technology.
- (b) Technical e.g. effective extension techniques.
- (c) Tactical e.g. package approach rather than isolated technology intervention.

Rationale for Gender Equality

Global statistics indicate that women are less likely to be involved in planning, research development or application of science than men. Statistics further indicate that women are unequally represented in science and their career progression is not comparable to their male colleagues. Why is it that the numbers of women in scientific institutions remain below those of men. An understanding of the logic of exclusion/inclusion is key to understanding the dearth of women in science. Understanding the obstacles women face can assist both managers and staff to better understand how organizations perpetuate gender bias. It can also help women scientists to understand that the constraints they face are not simply individual problems but are likely related to systematic issues within the culture of scientific organizations.

Family education status and the farm women

Sarkar (1994) stated that family education status of farm women has found to be significantly associated with planning process, decision making process, perceptual process, participatory process and interactional process. And according to Ghosh (1995), family education status has been found to be positively and significantly correlated with decision making of women in farm related activities. Moktan (1997) in his study found that family education status has been found to be positively and significantly correlated with decision making of women in farm related activities.

Per capita income and its effect on the livelihood of the farm women

Poonia (1988) stated that per capita income of

women was found to be negatively and significantly related with participation and time spent in agriculture. According to Sarkar (1994) income was highly correlated with planning process and decision making of women in dairy. Patel et al. (1995) found that there was also a significant relationship between annual family income and participation of rural women in household tasks, Agricultural operation and Animal husbandry activities.

KVK and the farm women

The participation and contribution of women in Indian agriculture are not only integral but also comprehensive. Farm women are participating to tune of 70-80% in all agriculture operations. Their participations are very much distinct in raising of seedlings, intercultural operation, weeding, harvesting and post harvest value addition activities. The other side of story is that they are getting only 15-20% of the return against their 70-80% contribution to the total productions. It is reality that almost all over India; they are getting less wages than their male counterpart, the reasons behind the discrimination. Empowerment is a process where by women become able to organize themselves to increase self reliance to assert their independent right to make choice and to control resources which will assist in challenging and eliminating their own subordination (Suguna. 2002). It is the process by which individuals, organizations and communities gain control and mastery over social and economic conditions (Satapathy, 2003). In a predominantly agrarian country like ours, nearly 75 percent of economically effective women are engaged in agriculture in comparison with 63 percent of their male counterparts. Almost 50 percent of rural female workers are agricultural labourers and 37 percent are cultivators. At the same time, around 70 percent of total farm work is performed by women only. The Krishi Vigyan Kendras have got clear cut mandates for up gradation farmwomen in term of capacity building through training, demonstrated campaign and sensitization programme. While child nutrition and mother care have become the prime issues to the nation, the KVK are organizing different vocational training for the women. Some of the trainings are specially designed for the women so that they can earn and sustain their family through remunerative enterprise like vermi compost, kitchen garden, tailoring, fabric, preservation of fruits and vegetable/nursery, floriculture, pisciculture ornamental fish etc. Despite the recognized facts

and a considerable amount of development, women are still restricted in their role as farmers by unequal rights as well as access to and control over resources especially land. For example, fewer than 10 percent of women farmers own land in India, Nepal and Thailand. In Kenya, although 98 percent of women work full time in agrarian sector, only 5 percent have land ownership titles. In addition, women still carry out their work without much help from agricultural support mechanisms such as extension agencies, input suppliers as well as credit institutions. Women farmers receive less than 5 percent of extension services worldwide. In many parts of the world today, there is an increasing trend towards what has been termed as the 'Feminization of Agriculture'. Men are becoming increasingly absent from farms in rural areas. In the era of economic change, men are migrating from rural areas to towns and cities in search of paid employment. Women are therefore taking more and more responsibilities for agricultural production. Besides working for longer hours than men in the agrarian sector, women have also been largely responsible for aspects like family food security, maintaining the bio-diversity through preservation of seeds etc. Their contribution has been substantial towards improving rural economy. The women who constitute almost half of the total population are seen as strong, potential work force to be tapped in strengthening the economy. Feminization of agriculture being an important issue in this direction needs active participation of women in agriculture as worker, manager and entrepreneur. But development among the vast segment of women population have not been taken care due to male dominance, perpetuation of socio-cultural restrictions and non-realization of women's capabilities to produce by the planners and policy makers. What we see today, women are embodiment of dependence characters and multi-purpose roles without social recognition.

Training programmes given by KVKs to farmers and farm women

KVKs generally deal with training programme related to needy areas to be served to both for men and women. The types of courses covered may be for package and practices of various field crops, vegetable crops, oil seed crops, plant protection, farm planning, care and feeding of animals, poultry keeping, irrigation and water management, marketing of agricultural product etc. To impart training efficiently, KVKs are arranged more

specialized persons. Some progressive farmers may be used as practical teachers. The help of agricultural universities, reputed NGOs, various agro-based industries and other state Govt. agencies are invited. As earlier explained KVK programmes will be problem oriented and field oriented with follow-up measures. "Learning by doing" the motto of KVK is always kept in mind while giving training. It gives direct bearing on our agricultural productivity. The training programmes further intend to cover backward areas, weaker sections and tribes, hill farmers on priority basis. Early adopters are always given priority, as they are the influential group in the rural environment. Courses in the Krishi Vigyan Kendra will be tailored to the needs of the areas served and will be for both men and women. The following types of courses might be provided, cultivation of local crops, application of package of practices; farm planning and plant protection; care and feeding of animals, poultry keeping, pisciculture, tubewell operation, irrigation and water control, nutrition, cooking and hygiene, Food processing and cooking, marketing of agricultural products, catching and marketing of fish etc.

KVK: The Vistas Ahead

- The whole episode of empirical research work generates the following recommendation for a successful functioning of KVK.
- While classifying adopted and non-adopted villages, the 'spill over' effect should be considered, i.e. the idea of isolated entity of adopted and non-adopted villages may go apparently vague.
- There should be catalogued information on education, holding size, income, motivation etc. while selecting trainees for KVK training programme.
- There should be an information inventory on adoption and rejection discontinuance and reinvention data, specially for farm women to conduct a back cross analysis or to elicit the missing links.
- Gender studies with special reference to women's unique preferences for crop variety, season, cultural need or perceived constraints on training efficacy training method, venue and time too. All these would be rendered presentable at time of delineating researchable extension agenda at KVKs.
- The modelling of technology socialization

process with gender issues and elements may go nationally important for forming a policy to support farm women for attaining sustainable development.

Conclusion

So in this changing scenario of Indian agriculture, there is a strong need for institutional innovations to foster the faster reach of innovations to the farmers and farm women as well. And woman has been as important as man. In fact, the status, employment and work performed by women in society are the indicators of a nation's overall progress. Without the participation of women in national activities, the social, economical or political progress of a country will be stagnated. Rural women can play a significant role by their effectual and competent involvement in entrepreneurial activities. So, the training programme must promote critical analysis in women and encourage them to think independently and challenge unequal gender relations and exploitation.

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Organic Food production: A Potential Discretion towards Sustainability for Food and Livelihood Security

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Abstract

Pesticides and fertilizers Excess or indiscriminate use of Pesticides and fertilizers has led to the entry of detrimental chemical compounds into food chain leading to serious health implications and deterioration of surrounding ecology. Besides, for sustainable agriculture system productivity and resource quality are also indispensable. In such situations, organic farming can play an important role to get-rid from these snags. Organic farming proliferates natural processes and cycles in harmony with environment. Hence, soil productivity and also pest control are maintained effectively. Organic agriculture contributes to food security by improving household food self-sufficiency and/or by building farmers' self-reliance. Blending of modern science and traditional knowledge, organic agriculture is capable enough to convert low input and subsistent farms to more productive one with increased capacity to manage locally available resources. Thus, enhanced food production, income generation and ecological conservation set the path towards sustainable development.

Keywords: Blending; Organic foods; food standards; GDP.

Introduction

Agriculture is the most imperative segment of Indian economy. The grand part of Indian GDP is directly extracted from agriculture as agriculture is the main source of livelihood of 55% rural dwelling Indians supporting 58% of nation's livelihood.² In the past history, green revolution

had made Indian agriculture a milestone. This in turn transformed the country from food deficiency to self-sufficiency using high yielding varieties and higher quality fertilizers and pesticides. But the twist came with the indiscriminate/ profuse utilization of field chemicals. Health and environmental issues comprising biomagnifications and bioaccumulation compelled the situation to

shift towards its alternative forms. Henceforth, demands of toxin-free agriculture within a limited arable land became bold. Thus, emphasis on organic farming came forward. In the organic farming system animal well-being is an imperative concern. This can be beneficial to both animals and even environment contradicting traditional production.¹⁴ For many regulars this is an important consideration for buying organic livestock products. However, various consumers believe that organic food products are much healthier. More than 130 countries consuming about 0.65% of total agricultural land are now practicing organic methodology with leading countries including Australia, China, Argentina, USA, Italy.²⁷

Organic Approach

Organic Farming

The divergence that sets organic farmers apart from conventional farmers is a holistic approach to the land and animals that is established, primarily

on long-term and natural processes. This approach avoids the use of synthetic chemicals is more environment-friendly, protects animals from inhumane treatment, promotes biodiversity and is sustainable. Hence this has now moved into the mainstream farming and one of the fastest growing food sectors. Efforts are made on efficient use of natural resources and renewable resources recycling for sustaining a healthy environment. Therefore, for agricultural and fodder farms, at least for three years (36 months) without application of prohibited materials (i.e. synthetic fertilizers, pesticide or GMOs), sewage, sludge or irradiation be strictly followed. Configuration of buffer zone for deterrence of contamination commencing adjoining land area. Usage of only organic seed manure and compost. Fertility management programme must not contaminate crop, soil or water with plant nutrients, pathogen, heavy metals or prohibited substances. Additionally, the burning of remnants of crop residues in the farmer's field. Thus, subsequently it will be helpful to reduce the detrimental effects of conventional farming and increase production, paving the path of alternative system.²⁴

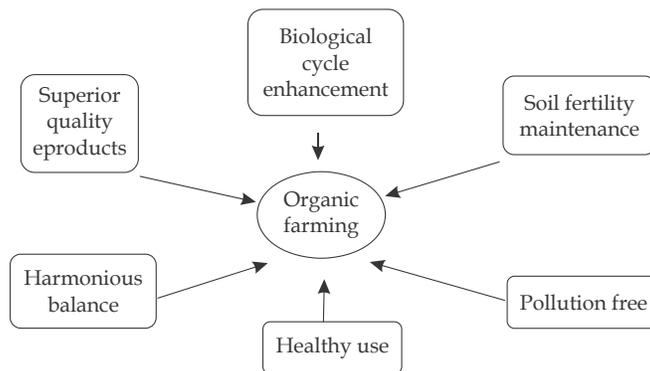


Fig. 1: Objectives of organic farming.

Organic Foods

For the words organic foods several different words are conversely used as like natural, biological, ecological, unsprayed, free of pesticides, alternative and environment-friendly produced but according to E.C. Regulation 2092/9, organic is the executive term [and this will be used as consistently as possible hereafter]. The word 'natural' applies generally to foods that are minimally processed and free of synthetic preservatives, artificial sweeteners, flavours, colours and other artificial additives, growth hormones, antibiotics, hydrogenated oils, stabilizers and emulsifiers. Most foods labelled natural are not subjected to government controls beyond the regulations and health codes that apply to all foods excluding meat and poultry.

The Department of Agriculture (USDA) and Food Safety and Inspection Service (FSIS) of the U.S. necessitate such food to be free of artificial flavours, colours, sweeteners, preservatives and ingredients that do not occur naturally in the food products. Natural meat and poultry must be minimally processed in a method that does not functionally modify the raw product quality. Additionally, the label should elucidate the use of the term natural, without the addition of synthetic harmful chemicals or ingredients.

Organic Food Standards

Certification of any food items by the concerned authorities or bodies remains mandatory for its proper identification and safe reception by

consumers. As these bodies help regulate the standards of foods by either private or public institutions. The countries which are having their organic legislation, government make approval and supervise the certification bodies. Some are also certified by the International Organic Accreditation Service (IOAS). IOAS is an independent non-governmental organization that authorizes certifiers who follow the voluntary standards of the International Federation of Organic Agriculture Movements (IFOAM). Moreover, Codex too helped in providing organic food guidelines in 1999. It adopted regulations on the production, processing,

labelling and marketing of organically produced foods providing a description of the 'organic' system. The 'organic' labelling being determined in order to ensure fair trade and to facilitate the development of the organic sector. Even then, the Codex and IFOAM guidelines for organic agriculture are minimal and can be objectified as 'standards for standards'. These are basically intended to guide governments and private certification bodies in setting concrete standards. The reasons for standard goals are depicted through the following pictorial representation (Fig. 2).

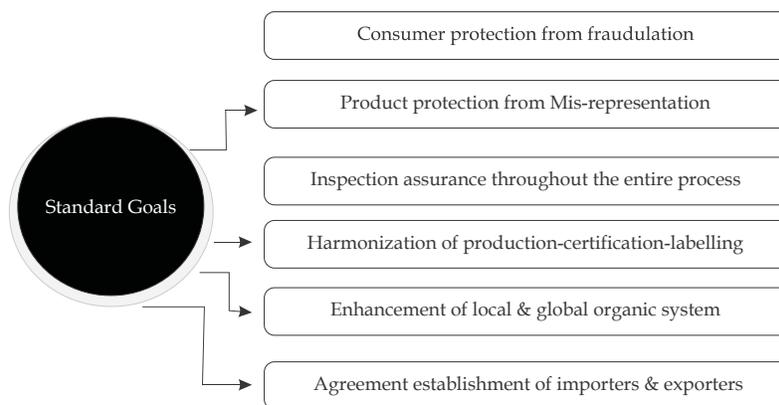


Fig. 2: Reasons for implementation of organic food standards.

The concept does not merely allied with production but the duty lies till its proper dispatch. Since the products need to be endowed with pest management practices to prevent pest infestations, equally these need to be protected from any sort of contamination. Packaging remains yet another important aspect in the final journey of organic production. Materials used for packaging containing fungicides, preservatives or fumigants are not prohibited from being used. Instead approved label claims for "100% organic" (100% organic ingredients including processing aids), "organic" (at least 95% organic ingredients), "made with organic ingredients" (at least 70% of organic ingredients) can be encouraged for use judiciously.

Livestock

Besides field and soil, livestock also plays a major role in market disruptions of total agricultural produce. Livestock facilitate the fertility of the soil, organization of flora through grazing, ornamenting biodiversity and facilitating complementary interactions on the farm and escalating the diversity of the farming system. Therefore, for the sake of

organicity, the livestock need also to be of 'chemical-free' origin. This can be attained from critical common managerial practices. Feedstuffs of plant origin, mineral origin, trace elements, vitamins or pro-vitamins can only be used if they are of natural origin with no supplementation of synthetic nitrogen or non-protein nitrogen compounds. Feedstuffs of animal origin are provided as prescribed by national legislation. Only natural sources binders, anticaking agents, emulsifiers, stabilizers, thickeners, surfactants, coagulants, antioxidants, preservatives, colouring agents (including pigments), flavours and appetite stimulants, probiotics, enzymes and micro-organisms are allowed. Medicinal substances, antibiotics, coccidiostats, growth promoters or any other substance intended to stimulate growth or production shall not be used in animal feeding. The fodder additives and processing aids be devoid of genetically engineered/modified organisms or products and comprised of only sea salt, coarse rock salt, yeasts, enzymes, whey, sugar or sugar products *viz.*, molasses, honey, lactic, acetic, formic and propionic bacteria or their natural acid products may be used when the weather conditions

for adequate fermentation remain unfavourable.

Health of animals should also be taken -in consideration to prevent disease. Therefore, the best way is selection of appropriate breeds or strains of animals having traits of disease resistance and implementation of animal husbandry practices encouraging strong resistance to disease and the prevention of infections. Provision of balanced organic diet with regular exercise which boosts animal's natural immunological defence system and avoidance of overstocking. In disease and incompatibility conditions, phyto-therapeutic (excluding antibiotics), homeopathic or ayurvedic products and trace elements may be preferred over chemical allopathic veterinary drugs. If the use of these above products is unlikely to be effective in combating illness or injury, allopathic drugs or antibiotics may be used with withholding periods should be the double of that required by legislation, in any case, a minimum of 48 hours. Where no alternative permitted treatment or management practice can assist, or, in cases required by law, vaccination of livestock, use of parasiticides or therapeutic use of veterinary drugs are permitted. But for preventative measures this line of treatment is prohibited. Growth stimulants or substances used for the purpose of stimulating growth or production are not permitted. Hormonal treatment may only be used for therapeutic reasons and under veterinary supervision.

Advantages

Accent on local resources and local ecological knowledge, organic agriculture has the potential to multiply the hands of farmers in their own

communities. The budding organic market demand and opportunity to foster agric-tourism for city dwellers have opened new income opportunities for organic farmers. Therefore, alliance of both producers and consumers supports markets to raise manifolds, cut out monopolies and consequently increases farm incomes. Organic certifications endorse economically viable and environmentally friendly use of natural resources. Besides, this promotes people to live in harmony with nature with economic benefits from their lands.

The foremost success of organic farming is the soil fertility as no synthetic nutrients in order to restore degraded soil is followed instead only the basic farming practices. Primarily which includes multi-cropping systems and crop rotations, cover crops, organic fertilizers and minimum tillage to maintain and improve soil quality. The organic soils also have the potential to reduce the cost of purifying drinking water, cause substantially less erosion and better moisture holding capacity. Also, are more buoyant to water stress as well as nutrient loss. Reports in Europe state that 30 to 40 percent more biomass and 30 to 100 percent more microbial activity have been recognized in organically managed soils compared to that of conventional soils. For any kind of soil, soil microbes are the most important components which synchronise soil organic matter decomposition and nutrient cycling. Normally, microbial biomass (C_{mic}) in natural soils ranges between 90 to 2300 μg per gram of dry soil whereas active microbial biomass in agricultural soils range between 75 to 272 μg per gram of dry soil which may be present in dormant state.³ A few evidences of such organic observations are listed in the following Table 1.

Table 1: Observations showing advantages on application of organic farming

Annotations	References
Improvement in growth and yield when rice seedlings are dipped in Panchagavya before transplanting.	4
Improvement in soil structure, porosity and organic matter content can be possible with organic management	17
Cow products viz., Panchagavya, Beejamruth and Jeevamruth possess abundant beneficial microflora like <i>Azospirillum</i> , <i>Azotobacter</i> , phosphobacteria, <i>Pseudomonas</i> , lactic acid bacteria and Methylophs with useful fungi and <i>Actinomyctes spp.</i>	23
Panchagavya helps in nitrogen fixation, growth hormone production and phytopathogens (of many plantation crops) control, proliferating plant growth	1
Panchagavya is nutritious to rhizosphere microorganisms as it contains macronutrients like N, P and K, essential micronutrients, many vitamins, essential amino acids, growth promoting factors like IAA, GA.	13
With massive microbial load Jeevamruth acts as tonic to enhance microbial activity in soil	16
Organic fertilizer provides nutrient to the standing as well as the succeeding crop	8
Cow urine being anti-fungal is a good source of plant nutrients	6
Substituent of synthetic fertilizers can be Kunapajala (bio-fertilizer, a fermented product)	11

In addition, sequestration of carbon in soil is another essential phenomenon. It perhaps is in the forms of soil organic carbon (SOC) and soil inorganic carbon (SIC). Comparatively the rate of SIC sequestration as secondary carbonates is low (5 to 150 kg C/ha/yr). Basically, it is emphasised by biogenic processes and carbonates leaching in groundwater, particularly in low carbonate irrigation water.¹⁵ Normally the soil carbon pool balances the input and output. In case of low carbon flux relative to storage, it leads sequestration in soil whereas a higher flux causes carbon loss. A loss of 30–70% of predecessor SOC pool of soil has already been reported in the most agricultural soils.¹⁰ However, soil carbon sequestration is cost effective and even subsidize up to about 89% of total carbon mitigation.²² In organic farming, permanent soil

cover is an intrinsic part of the agriculture system. The successive quality improvements of soil enables reduce cost of future fertilizer needs.⁷

The restricted use of mineral fertilizers reduces the use of non-renewable energy (fossil fuels) which in turn condenses the emissions of greenhouse gases. The positive impact of organic agriculture practices on atmosphere, lithosphere, hydrosphere and biodiversity helps instigating convention to combat desertification by implementing international environmental agreements viz., the Kyoto Protocol, Convention on Biological Diversity (Decision III/11 on the conservation and use of agricultural biological diversity) and national strategies. Below are listed a few field reports which show the advantageous characters of the chemical-free agriculture.

Table 2: Field reports showing successful trials of different organic applications

Target	Organics	Inference	References
Secondary and micronutrients (Ca, S and Fe), macronutrients (NPK) contents of leaves and pods of annual moringa	Poultry manure + neem cake + Panchagavya treatments	Superior	5
<i>Abelmoschus esculentus</i> yield parameters	3% panchagavya spray	Increased	19
Photosynthetic pigments content viz., chl. A, chl. B and carotenoid	3% panchagavya spray	Increased	25
Root yield	4% panchagavya spray	Superior	9
Nutrient management in soybean-wheat cropping system	Organic manures + fermented organics	Significant improvement of soil microbial population and enzymatic activity	20
Aswagandha farming	Poultry manure + 3% Panchgavya	Highest root yield of 1354.50 kg ha ⁻¹	12
Chilli farming	3% panchagavya	Highest plant height, early 50% flowering, highest number of flowers, highest yield/ha	26
Rice yield level	Biodigester liquid manures	Increased	21

Organic farming creates job opportunities (generally rural), as it requires over 15% more labour than traditional farming.¹⁸ Because organic farming techniques involve strip farming, non-chemical weeding and production, collection and transportation of organic supplements, all of which requires significant numbers of manpower. Objectives of crop rotations, natural inputs, local breeds and species and family activities aid organic to be a natural link between agricultural practices and biodiversity for every species of life often flourish in organic settings. Absence of synthetic pesticides, presence of hedges and higher crop density on organic farms, assist safe access to food and even shelter for wildlife species.

Human Profits

Mothers consuming mostly organic milk and meat products were found to have about 50% higher level of ruminic acid in their breast milk. Conjugated lenoleic acid (CLA) is responsible for most of the health benefits through milk and meat. The better reliance of organic beef and dairy farmers on pasture and forage grasses increase the level of CLAs in milk and beef and return in the breast milk of women eating such organic animal produce. Multiple studies show that organic varieties do provide significantly greater levels of iron, magnesium and phosphorus than non-organic varieties of same foods. In addition, organic

foods typically supply greater levels of important antioxidant and phytochemicals (anthocyanins, flavonoids and carotenoids). Clear health benefits from consuming organic dairy products have been established in regard to allergic dermatitis. Relative studies represent lower nitrate contents and less pesticide residues contradicting with usually higher levels of Vitamin C and phenolic compounds in organic plant products. Whereas, higher levels of omega-3 fatty acids and conjugated linoleic acid are common in livestock products from organically raised animals. Conversely, the discrepancy in outcomes of comparative studies is very high, depending on plant fertilization, ripening stage and plant age at harvest and weather conditions. Furthermore, there appeared no simple relationship between nutritional value and health effects. It is consequently difficult to draw conclusions from analytical data about the health effects of organic foods. Although some *invitro* studies comparing health-related richness of organic and conventional foods showed higher antioxidative and antimutagenic activity in addition to better inhibition of cancer cell proliferation of organically produced foods. Modern human epidemiological studies associated with consumption of organic foods revealed lower risks of allergies, while findings of human intervention studies were still vague. The assumption might be that organic food increases the capacity of living organisms towards resilience.

Constraints

The most carving disadvantage of organic farming is the requirement of two to three years for converted fields to be certified as organic which indeed requires a long-term planning and careful cost-benefits analysis. Though standards, inspection, certification and accreditation (or the organic guarantee system) ensure credibility. But more harmonized approach is necessary for proper regulation and ensuring the consistent appliance of organic rules and standards so designed taking into account all stakeholders' interests. Side-by-side, even if in arid lands, organic agriculture can be a viable alternative but also there lies a number of constraints including lack of knowledge, scarcity of organic materials, insecure land tenure, 'old fashioned' perception of organic agriculture and the most importantly promotion of chemical inputs in farming through extension services, as to adopt the very agriculture systems even its single technique.

Thus, absence of supportive policy, loss of crop yield, non achievement of expected quality, failure of organic pest management, shortage of biomass and livestock, lack of quality seeds supporting organic agriculture, lack of storage, transport and organized organic marketing systems, vested interests of chemical and pesticide lobby, lack of awareness and guideline for organic farming, inability to meet the export demand, complexity and high cost of organic certification system, scarcity and high cost for quality analysis consist the major hurdles of upliftment of organic agriculture fruitfully. Consequently, to thrive in the organic sector, there needs more than growing markets, governmental and intergovernmental policies to synchronise standards, developmental supports through research and advisory systems, education and consumer information, regulation of synthetic inputs use and implementation of global environmental treaties.

Future of Indian Organic Farming

India is dignified for immense growth as compared with the growing domestic market and organic is the fastest growing food sector in terms of both land use and market size. Hence, key of Indian organic success lies with the growth of its own domestic markets. Moreover, India possesses tremendous potential to cultivate crops organically due to availability of sizable acreage which leads India to emerge as a major supplier of organic products in the world's organic market. Hence, keeping in pace with this growing demand, lots more technological innovation like Inhana Rational Farming (IRF) Technology (Indian organic farming practice) can demonstrate some promising results. Implementation of IFR methodologies in field will ensure economically viable organic agriculture and encourages its adoption without any subsidy scheme or guaranteed premium price. Henceforth, considering the increasing awareness about the safety and quality of foods and long-term sustainability and productivity of the system, the organic farming can be emerged as an alternative system of farming in our country as it safeguards a debt free, profitable livelihood option.

Conclusion

Ecologically and economically sustainable organic farming is the pre-requisite for enabling wider adaptability, secured livelihoods and ensuring

affordability at the consumer's end. India has a rich history of organic farming and the increasing domestic market of organic food can provide the necessary drive to the organic movement. For large scale organic conversion, awareness program at both the consumer and farmers' end is necessary. But most importantly innovative organic farming technologies can popularize the practice even among the resource poor farmers by ensuring ecologically and economically sustainable organic crop production in a time bound manner. Case studies of IRF Organic Practice also testify the corresponding GHG mitigation and adaptation potential as reflected in the high carbon sequestration, soil resource regeneration, high energy use efficiency as well as development of plant resilience; but the highlight remains its cost effectiveness and time bound results. Flexible requirements to establish equivalency among regulatory systems is the main challenge ahead for the organic agriculture community. The endorsement of organic agriculture is not a small task, but can be achieved through effective policies, scientific education, exercising farmer's skill and public rendezvous.

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Abstract Page

The second page should carry the full title of the manuscript and an abstract (of no more than 150 words for case reports, brief reports and 250 words for original articles). The abstract should be structured and state the Context (Background), Aims, Settings and Design, Methods and Materials, Statistical analysis used, Results and Conclusions. Below the abstract should provide 3 to 10 keywords.

Introduction

State the background of the study and purpose of the study and summarize the rationale for the study or observation.

Methods

The methods section should include only information that was available at the time the plan or protocol for the study was written such as study approach, design, type of sample, sample size, sampling technique, setting of the study, description of data collection tools and methods; all information obtained during the conduct of the study belongs in the Results section.

Reports of randomized clinical trials should be based on the CONSORT Statement (<http://www.consort-statement.org>). When reporting experiments on human subjects, indicate whether the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional or regional) and with the Helsinki Declaration of 1975, as revised in 2000 (available at http://www.wma.net/e/policy/17-c_e.html).

Results

Present your results in logical sequence in the text, tables, and illustrations, giving the main or most important findings first. Do not repeat in the text all the data in the tables or illustrations; emphasize or summarize only important observations. Extra or supplementary materials and technical details can be placed in an appendix where it will be accessible but will not interrupt the flow of the text; alternatively, it can be published only in the electronic version of the journal.

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Include summary of key findings (primary outcome measures, secondary outcome measures, results as they relate to a prior hypothesis); Strengths and limitations of the study (study question, study design, data collection, analysis and interpretation); Interpretation and implications in the context of the totality of evidence (is there a systematic review to refer to, if not, could one be reasonably done here and now?, What this study adds to the available evidence, effects on patient care and health policy, possible mechanisms)? Controversies raised by this study; and Future research directions (for this particular research collaboration, underlying mechanisms, clinical

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References

List references in alphabetical order. Each listed reference should be cited in text (not in alphabetic order), and each text citation should be listed in the References section. Identify references in text, tables, and legends by Arabic numerals in square bracket (e.g. [10]). Please refer to ICMJE Guidelines (http://www.nlm.nih.gov/bsd/uniform_requirements.html) for more examples.

Standard journal article

[1] Flink H, Tegelberg Å, Thörn M, Lagerlöf F. Effect of oral iron supplementation on unstimulated salivary flow rate: A randomized, double-blind, placebo-controlled trial. *J Oral Pathol Med* 2006; 35: 540-7.

[2] Twetman S, Axelsson S, Dahlgren H, Holm AK, Källestål C, Lagerlöf F, et al. Caries-preventive effect of fluoride toothpaste: A systematic review. *Acta Odontol Scand* 2003; 61: 347-55.

Article in supplement or special issue

[3] Fleischer W, Reimer K. Povidone-iodine antiseptics. State of the art. *Dermatology* 1997; 195 Suppl 2: 3-9.

Corporate (collective) author

[4] American Academy of Periodontology. Sonic and ultrasonic scalers in periodontics. *J Periodontol* 2000; 71: 1792-801.

Unpublished article

[5] Garoushi S, Lassila LV, Tezvergil A, Vallittu PK. Static and fatigue compression test for particulate filler composite resin with fiber-reinforced composite substructure. *Dent Mater* 2006.

Personal author(s)

[6] Hosmer D, Lemeshow S. Applied logistic regression, 2nd edn. New York: Wiley-Interscience; 2000.

Chapter in book

[7] Nauntofte B, Tenovou J, Lagerlöf F. Secretion and composition of saliva. In: Fejerskov O,

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We need the Ethics committee approval letter from an Institutional ethical committee (IEC) or an institutional review board (IRB) to publish your Research article or author should submit a statement that the study does not require ethics approval along with evidence. The evidence could either be consent from patients is available and there are no ethics issues in the paper or a letter from an IRB stating that the study in question does not require ethics approval.

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Standard abbreviations should be used and be spelt out when first used in the text. Abbreviations should not be used in the title or abstract.

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- Conflicts of interest disclosed

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- Author for correspondence, with e-mail address provided.
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